

11-12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable for obviousness over Hatano in view of U.S. Patent Number 5,990,500 to Okazaki. Claims 7 and 14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable for obviousness over Hatano in view of JP 03263878 A.

The principles of the present invention are generally directed to a flip-chip light-emitting device that does not include a soldering pad in its main light-emitting surface. The light-emitting device includes an electrode that has good reflectivity of light. Therefore, the light directed to the electrode may be reflected by the electrode to the outside through the transparent substrate to increase the light-emitting efficiency of the device. Further, the electrode may have sufficient size and thickness to provide an effective current spreading effect, such that the light-emitting diode may achieve an increased light-emitting result.

With regard to the 103 rejection of claims 1-3, 6, 8-10 and 13, Applicants respectfully submit that Applicants' claimed invention of a "light-emitting device" (claim 1, line 1; claim 8, line 1) "wherein said second electrode has good reflectivity of light and covers most of the outer surface of said p-type semiconductor layer" (claim 1, lines 9-10; claim 8, lines 9-10) is not taught or suggested by Hatano. Hatano generally relates to "a semiconductor laser and to a semiconductor light-emitting element", such as those illustrated in figures 6, 7, 11A, and 11B. The illustration of figure 14 and its corresponding descriptions, as pointed out by the Examiner, are related to a semiconductor laser, rather than a light-emitting device (col. 4, lines 26-27 and col. 24, line 34-col. 28, line 4). It is well known in the art that the structure of a semiconductor laser is different from that of a light-emitting device. In addition, and further

explained below, figure 14 and the corresponding description do not disclose or suggest the technical features of the principles of the present invention.

From the descriptions of the embodiment in Hatano illustrated in figure 14, it is noted that "in this case, the chip was formed such that the end face of laser was constituted by the A-face, i.e. (11-20) face of the GaN-based material" (col. 27, lines 57-60) and that "subsequently, a multi-layer film comprising a SiO₂ film and a TiO₂ film was formed on the surface to be formed into the end face of a laser with a view to improve the reflectance of the end face of laser" (col. 27, lines 61-64). Apparently, in the embodiment illustrated in figure 14 of Hatano et al., the end face of the laser is the (11-20) face of the GaN-based material, not the face of the electrode 722. In addition, Hatano clearly describes that it is the end face, not the electrode 722, that improves the reflectance. Therefore, the embodiment illustrated in figure 14 and the related description neither disclose nor suggest a "light-emitting device" with an electrode that "has good reflectivity of light" and can provide effective current spreading effect.

Furthermore, the Office Action on page 3 states, "although Hatano et al. do not explicitly state that the second electrode has good reflectivity of light. It is well known in the art that Pt/Ti/Pt/Au has good reflectivity of light" and that "in the alternative, Hatano et al. teach that the electrode material comprise Al or Ag that has good reflectivity of light." Applicants respectfully disagree with the Office Action. As stated in the background of Applicants' application and in U.S. Patent Number 6,130,446 (Takeuchi et al.) cited by the Examiner, the corresponding electrode of conventional light-emitting devices is transparent, not reflective, and also composed of a laminated film of several metallic materials such as Ni, Au, Ti, Al, etc.

(see, for example, col. 5, lines 38-59 and col. 7, line 30 - col. 8, line 49 of US Patent 5,563,422; col. 7, lines 30-37 of US Patent 6,130,446).

It is apparent that conventional light-emitting devices teach that an electrode composed of a laminated film of several metallic materials, such as Ni, Au, Ti, Al etc. is transparent. Therefore, it is impossible that the metallic laminate electrode taught by conventional light-emitting devices may have good reflectivity of light. As such, in the field of "light-emitting devices", an electrode composed of a laminated film of several metallic materials, such as Ni, Au, Ti, Al, etc., is not taught or suggested to have "good reflectivity of light". Applicants, therefore, respectfully request that the Examiner withdraw the § 103(a) rejection against independent claims 1 and 8. Accordingly, dependent claims 2-3, 6, 9-10 and 13 should be allowable for at least the same reasons.


With regard to the 103 rejection of claims 4-5 and 11-12, Okazaki teaches a base having a first and second conductive portion respectively connected to the first and second electrodes of a light-emitting device. Okazaki, however, fails to disclose an electrode "having good reflectivity of light and covers most of the outer surface of said p-type semiconductor layer" (claims 1 and 8, lines 9-10). Applicants respectfully submit that Hatano in view of Okazaki, either alone or in combination, does not teach or suggest Applicants' claimed invention. Therefore, claims 4-5 and 11-12 should be allowable over the art of record for at least the same reasons as claims 1 and 8. Applicants respectfully request that the § 103(a) rejection against claims 4-5 and 11-12 be withdrawn.

With regard to the 103 rejection of claims 7 and 14, JP 03263878 relates to a photovoltaic device, rather than a light-emitting device. Hitano in view of JP 03263878, either alone or in combination, does not teach or suggest Applicants' claimed invention of an electrode having "a good reflectivity of light and covers most of the outer surface of said p-type semiconductor layer". Claims 7 and 14, which depend from independent claims 1 and 8, should be allowable for at least the same reasons. Accordingly, Applicants respectfully request that the § 103(a) rejection against claims 7 and 14 be withdrawn.

In view of the foregoing, Applicants submit that no further impediments exist to the allowance of this application and therefore solicit an early notice of allowance.

Respectfully submitted,

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